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bleaching with a peracid is at maximum 4.

REMARKS

Reconsideration of this application as amended is respectfully submitted.

Former Claim 3 has been cancelled and its subject matter incorporated into Claim 1 as amended. This amendment is believed to reduce the number of remaining issues and not raise any new issues. As amended, Claim 1 now also recites that the kappa number of the pulp before the post-bleaching with a peracid is at maximum 4. A "marked up" copy of Claim 1 as amended is enclosed with additions being underlined and deletions contained within brackets.

As now claimed, applicant's invention is directed to an improvement in a method for the bleaching of chemical pulp, wherein the pulp is treated in a plurality of different steps and wherein at least in one step a bleaching solution which contains a peracid is used. The improvement claimed in the method is using the peracid in a post-bleaching which is the last step of the bleaching process, the post-bleaching taking place in the presence of one or several earth-alkali metal compounds, the pH of the post-bleaching solution is in the range of 3-8, and the kappa number of the pulp before the post-bleaching with a peracid is at maximum 4.

Post-bleaching is applied to pulp for which the delignification process proper in a bleach-plant is already finished. A high degree of delignification, a high brightness and a low kappa number are attained by applicant's claimed method. The purpose of post-bleaching is to compensate for the decrease of brightness and thereby avoid the need of overbleaching in the delignification process. Overbleaching is disadvantageous because it results in a high consumption of chemicals. Preferably, post-bleaching is carried out outside the bleach plant in a pulp flow piper or a storage tower or at a paper machine.

Applicant's claimed invention is directed a method for the bleaching of chemical pulp in which peracid is used in combination with at least one earth-alkali metal compound at the post-bleaching step. The claimed method brings about an increase of brightness while the use of the earth-alkali metal compound effectively counteracts the adverse effect peracid alone would have on the viscosity and strength of the pulp. This has been shown in the working examples.

A person skilled in the art would have understood the term "post-bleaching" which constitutes the last step of, or rather an appendix to, a multi-stage method for the bleaching of chemical pulp.

Former Claims 1-16 have been rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 3,865,685 to Hebbel, et al., with or without WO 97/45586. The primary reference, Hebbel, et al., is clearly deficient. The Office Action argues, based on Example VIII of Hebbel, et al., that Hebbel, et al. describe a 5-stage bleaching sequence starting with, e.g., peracetic acid and ending with a final post-bleaching stage with use of a per compound. However, the first stage described by Hebbel, et al. explicitly uses hydrogen peroxide, not peracetic acid. Moreover, the per compound used for the final step is specified as hydrogen peroxide.

Further, Hebbel, et al. do not teach or suggest applicant's claimed post-bleaching step. As pointed out above, to a person skilled in the art, post-bleaching is a complementary step after the bleaching process proper and as much the very last bleaching step before feeding the pulp to a paper machine. Such post-bleaching can advantageously be carried out after the pulp has left the bleaching plant, in a storage tower or at a paper machine. According to Example VIII of Hebbel, et al. the pulp was diluted after each bleaching step and then partially dewatered to produce a filtrate, these measures applying also to the fifth and last bleaching step. A person

skilled in the art would not regard the last step of the process described by Hebbel, et al. as a “post-bleaching” step.

Also, as now amended, applicant’s claimed method further distinguishes over Hebbel, et al., including Example VII thereof, in that the claimed post-bleaching solution has a pH of 3-8. Hebbel, et al. teach a bleaching solution containing besides hydrogen peroxide also 1.0% of NaOH. Such a solution is strongly alkaline, having a pH well above 8. Hebbel, et al., therefore, do not teach or suggest post-bleaching with peracid in acidic or neutral conditions as specified by the claimed pH range of 3 to 8.

The Office Action also argues that Hebbel et al. “further teaches that a magnesium sulphate (alkaline earth compound) can be used as a complex builder or stabilizer.” Office Action dated September 13, 2001, p. 2. However, the disclosed use of an earth alkali metal compound in the Hebbel et al. bleaching process is general and vague. There is no specific teaching of use of an earth alkali metal compound in a final peracid post-bleaching step, much less a teaching of such bleaching in neutral or acid conditions, applied to a pulp having a kappa number of 4 or less.

The Office Action further argues that the teaching in Example VIII of Hebbel et al. of bleaching pulp in a 5-stage bleaching process is properly combinable with, and can be interpreted in light of, the teaching in Example VII of Hebbel et al. that after four stages of the Hebbel et al. bleaching process, “the brightness is over 90% MgO.” Office Action dated September 13, 2001, p. 2. From the teaching that the first 4 stages of the bleaching process described in Example VII produce a pulp with a brightness over 90% MgO, the Office Action concludes that “It would have been obvious to the routineer that after the first 4 stages [of the bleaching process described in Example VIII of] HEBBEL the brightness [of the pulp] would be

above 85% ISO and [the pulp would have] a kappa number less than 4.” Office Action dated September 13, 2001, p. 2.

However, the arguments and conclusions of the Office Action are based on the incorrect premise that the teachings of Examples VII and VIII of Hebbel et al. are properly combinable in the manner done by the Office Action. They are not. The first four stages of the bleaching process described in Example VIII of Hebbel et al. are markedly different from the first four stages of the bleaching process described in Example VII of Hebbel et al. Thus, they are not properly combinable in the manner done in the Office Action. Moreover, there is no description in either Example VII or VIII of Hebbel et al. of a bleaching process for pulp subjected to a final peracid post-bleaching step that produces a pulp having a kappa number of 4 or less. Neither Example VII or VIII of Hebbel et al. teaches or suggests a bleaching process as claimed by applicant that produces a pulp having a kappa number of 4 or less.

Kappa number and brightness are two different parameters of pulp, which in principle do not depend on each other. Kappa number is a measure of the degree of delignification of a pulp, whereas brightness is merely a matter of its color. Even though a decreasing kappa number usually brings about an increasing brightness, there are other ways to increase brightness than delignification, and brightness can change with time. Consequently, brightness is not an adequate basis for gauging the kappa number with any certainty. For these reasons, applicant respectfully submits that Claims 1-2, 4-7 and 9-16 define patentable subject matter over the teaching of Hebbel et al. Withdrawal of the rejection of such claims under 35 U.S.C. §103(a) as obvious over Hebbel et al. is respectfully requested.

The teaching of the secondary reference, WO 97/45586, does not cure the above stated deficiencies of the primary reference, Hebbel et al. WO 97/45586 describes a peracid step in the

pH range of 4-8, but this step is not a post-bleaching step as there is always a subsequent alkaline step closing the bleaching sequence. According to the tables, the pH of the final alkaline step is within the range of 9-11. Also, the kappa numbers of the pulp subjected to the peracid step are higher than 4, namely 4.9 or 5.6 according to tables 5 and 6. There are lower kappa numbers mentioned in the tables, but these are values resulting from the peracid step, and are not initial values. Thus, WO 97/45586 does not supply the deficiencies of Hebbel et al. and their combination does not teach or suggest applicant's invention as now claimed in Claims 1-2, 4-7 and 9-16 as amended.

Moreover, the combination of Hebbel et al. and WO 97/45586 does not teach or suggest a bleaching process in which the amount of peracid used for post-bleaching is 0.5 to 3 kg/tp, as claimed by applicant in Claim 4. For example, in WO 97/45586, the amount of peracid used for post-bleaching is always at least 5 kg/tp. For these reasons, applicant respectfully submits that Claims 1-2, 4-7 and 9-16 define patentable subject matter over the combined teachings of Hebbel et al. and WO 97/45586. Withdrawal of the rejection of such claims under 35 U.S.C. §103(a) as obvious over Hebbel et al. in view of WO 97/45586 is respectfully requested.

Former Claim 14 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Hebbel, et al. in view of U.S. Patent No. 4,222,819 to Fossum, et al. The deficiencies of the primary reference, Hebbel, et al. are set forth above. Fossum, et al. do not cure these deficiencies. Fossum, et al. has been cited as describing the use of certain calcium salts instead of magnesium salt. For the reasons set forth above with respect to Claim 1 (upon which claim 14 through Claim 6 depends), Claim 14 is believed to define patentable subject matter. Withdrawal of the rejection applied to former Claim 14 under 35 U.S.C. §103(a) as being unpatentable over Hebbel, et al. in view of Fossum, et al. is respectfully requested.

In light of the foregoing, applicant respectfully submits that Claims 1-2, 4-7 and 9-16 as amended define patentable subject matter over the prior art of record, alone or in combination. Entry of this Amendment After Final Rejection and allowance of all Claims is earnestly solicited.

Respectfully submitted,



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MARKED UP COPY OF AMENDED CLAIMS

1. (three times amended) In a method for the bleaching of chemical pulp, wherein the pulp is treated in a plurality of different steps and wherein at least in one step a bleaching solution which contains a peracid is used, the improvement in which the peracid is used in an post-bleaching which is the last step of the bleaching process, the post-bleaching taking place in the presence of one or several earth-alkali metal compounds, wherein the pH of the post-bleaching solution is within the range of 3-8, and the kappa number of the pulp before the post-bleaching with a peracid is at maximum 4.